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Galileo's Instruments of Credit: Telescopes, Images, Secrecy
(review)

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took shape after the event in a long succession of retrials up to the present day. Finocchiaro reproduces the corrections made to *De Revolutionibus* and many versions of the official announcements of Galileo's abjuration propagated around Europe after 1633. He traces the efforts of Descartes to ascertain the meaning of the trial for his manuscript, *Le Monde*, and reviews the anti-Copernican and anti-Galilean efforts of Inchofer and Riccioli, among others. There are interesting surprises: the claim that Urban was angry, in 1632, because his own position was stated by Simplicio has no basis in fact. The story was first suggested a few years after the trial, at which time an exchange of letters between Galileo's friends and authorities near the pope offered the reassurance that no offense had been taken — yet the story continues to circulate today. The retrials increasingly became defenses of the Church's actions as the elements of geokineticism and heliocentrism were confirmed and the Church relaxed its grip on astronomy and cosmology. There is an extensive treatment of the official removal of the ban on Copernicus during the Settele affair (1820), of the work of Wohlwill, Duhem, Gemelli, Brecht, Koestler, Paschini, and, finally, of the Galileo Commission. Finocchiaro says that the commission became increasingly anti-Galilean and suspects that John Paul distanced himself from its final report in his summary address. All in all, *Retrying Galileo* is a gold mine for the historiography of the trial.

Stéphane Garcia's *Élie Diodati et Galilée* is a welcome treatment of the intellectual life of savants outside the official circles of the Church in the first half of the seventeenth century. Diodati, son of an important Italian-Swiss Calvinist family, served as a diplomat for the government of France and traveled in Germany, Italy, France, Holland, and England. Garcia describes Diodati's commitment to the new philosophy and his pivotal recognition of the importance of contact and correspondence and the role of the discreet intermediary in strengthening and deepening the level of philosophical discussion. Diodati personally met with a large number of geographically scattered scholars and philosophers who pursued a surprising diversity of interests, and he belonged to informal clubs and societies in Paris that met regularly to promote the same interests. Garcia explores what can be gathered about the activities of these groups and the nature of scientific networks half a century before the birth of the Royal Society in Britain. It becomes clear that the savants believed in the need for freedom to pursue philosophy and, like Galileo, recognized that the Church was committing a fateful error in its condemnation of Copernicus precisely because it restrained the liberty of scientific investigation with questionable literal interpretations of Scripture.

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Mario Biagioli. *Galileo's Instruments of Credit: Telescopes, Images, Secrecy*. Chicago: The University of Chicago Press, 2006. 302 pp. index. illus. bibl. \$35. ISBN: 0-226-04561-7.

More than a decade ago, in *Galileo, Courtier*, Mario Biagioli argued that Galileo's science depended upon his masterly exploitation of the early modern

patronage system. In his recent book *Galileo's Instruments of Credit*, Biagioli revisits Galileo's rise from unknown university professor in Padua to the star of the Medici court in Florence who battled with the Roman theologians over Copernicanism. Biagioli sheds new light on this well-known episode in the history of science by borrowing metaphors from the world of economy. The construction of a *market*, the weighing of potential *credits* versus *risks*, the search for *investors*, and the creation of a *monopoly* might sound like the content of a conversation on Wall Street, but Biagioli argues that this terminology applies equally well to the making of Galileo's science.

The book traces Galileo's whereabouts between different places — from Padua to Florence and then to Rome — and between different economies. Biagioli argues that Galileo's move from Padua to Florence was also a move between two different credit systems. In Padua, Galileo operated in an artisanal economy in which he received monetary credit for the sale of goods, for example, his geometric and military compass. With the publication of *Sidereus Nuncius* (1610), Galileo entered the economy of print and discoveries. Instead of money for the sale of a useful instrument — and other types of labor-intensive related activities such as private teaching on the instrument — Galileo attempted, successfully, to receive non-local credibility in exchange for the novelty of his telescopic discoveries. Biagioli readily admits that these two credit systems never come in their pure and abstract form. Still in Padua, Galileo stated (Biagioli notes) that the actions of Baldassare Capra, whom he accused of the piracy of his instrument and its instruction manual, “had hurt his honor, not his purse” (9). Biagioli also takes pains to show that the *Sidereus Nuncius* falls between these two different economies.

Galileo's Instruments of Credit is not a book about the material basis of Galileo's science, the instruments — the compass and the telescope — for which he received credit. It is rather about the strategies and tactics which he used to gain and maximize his credit. In his choice of these tactics Galileo was — Biagioli cites Feyerabend with approval — opportunistic. A methodology was a luxury which Galileo could not afford, Biagioli claims, because he had to respond to highly mutable working conditions. Biagioli follows Galileo through these changing circumstances in four chapters, roughly following the chronological order of Galileo's career. Chapter 1 finds Galileo in Padua in search of Medicean support for his discovery of the satellites of Jupiter. Biagioli draws an analogy between the construction of scientific authority and investment decisions. What is most surprising, he argues, is that the Medici invested in Galileo's claims on the basis of partial information. Biagioli concludes that geographic distance, which allows for this partial perception, is constitutive of knowledge.

In chapter 2, Biagioli shows that Galileo's concerns in the wake of the publication of the *Sidereus Nuncius* were not with the replication of his telescopic discoveries, but with keeping others from catching up with him and, thus, with monopolizing these discoveries. These monopolistic tactics made Galileo secretive about the telescope. Biagioli contextualizes Galileo's uncooperative attitude within the economy of the early modern inventor. The conventions of early modern

patents shed substantially new light on Galileo's secrecy about telescope-making skills, but Biagioli is too enthusiastic when he makes them responsible for the absence of "a description of the optical processes of image formation through a telescope" (126), an optical theory which would have been little helpful in building a better telescope.

The *Sidereus Nuncius* was, of course, no patent application, and Biagioli analyzes the narrative and pictorial tactics which Galileo used to convince his readers of the existence of his celestial discoveries. These pictorial tactics — movie-like visual sequences, the innovative character of which Biagioli overestimates— which represent periodicity and change in time, are the central focus of chapter 3, on the sunspot controversy between Galileo and Christoph Scheiner. Finally, in chapter 4, Biagioli attempts to show how Galileo's use of the metaphor of the book of nature emerged in response to theologians' criticisms of Galileo's portrayal of the relationship between astronomical knowledge and scriptural exegesis.

Despite shortcomings — which arise from Biagioli's attention to tactics of secrecy and disclosure at the expense of the content of the disclosure and the historicity of its packaging — this well-researched book brings fresh insights, especially regarding the concept of intellectual property, in a seemingly all-too-familiar episode in the history of science. Its sweeping style will appeal to broader audiences than that made up by the Galileo Industry.

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Marcus Hellyer. *Catholic Physics: Jesuit Natural Philosophy in Early Modern Germany*.

Notre Dame: University of Notre Dame Press, 2005. xii + 336 pp. index. append. illus. tpls. bibl. \$50. ISBN: 0-268-03071-5.

In 1775, two years after the dissolution of the Society of Jesus by Pope Clement XIV, Empress Maria Teresa was asked to approve the founding of a scientific Academy in Vienna. Casting her eyes on the proposed list of local members, the empress cringed: "I could not possibly decide to start an academy with three ex-Jesuits and a worthy professor of chemistry," she demurred. "We would be the laughing-stock of the world." No more was heard of the matter. Marcus Hellyer does not recount this anecdote but he conjures up an analogous mentality when recounting the events leading to the foundation of the Bavarian Academy of Sciences a decade-and-a-half earlier. The moving force behind the new institution was Georg Lori, whose visceral detestation of the Jesuits made him insist, successfully as it turned out, not only on total independence of the academy from the Jesuit-controlled University of Ingolstadt, but on barring the admittance of all Jesuits. "Our constitution is very democratic," he wrote his patron, and in democracies "all tyrants are hated. Does Your Excellency not know those people who have ruled over scholars and science like a sultan over the Muslims?"